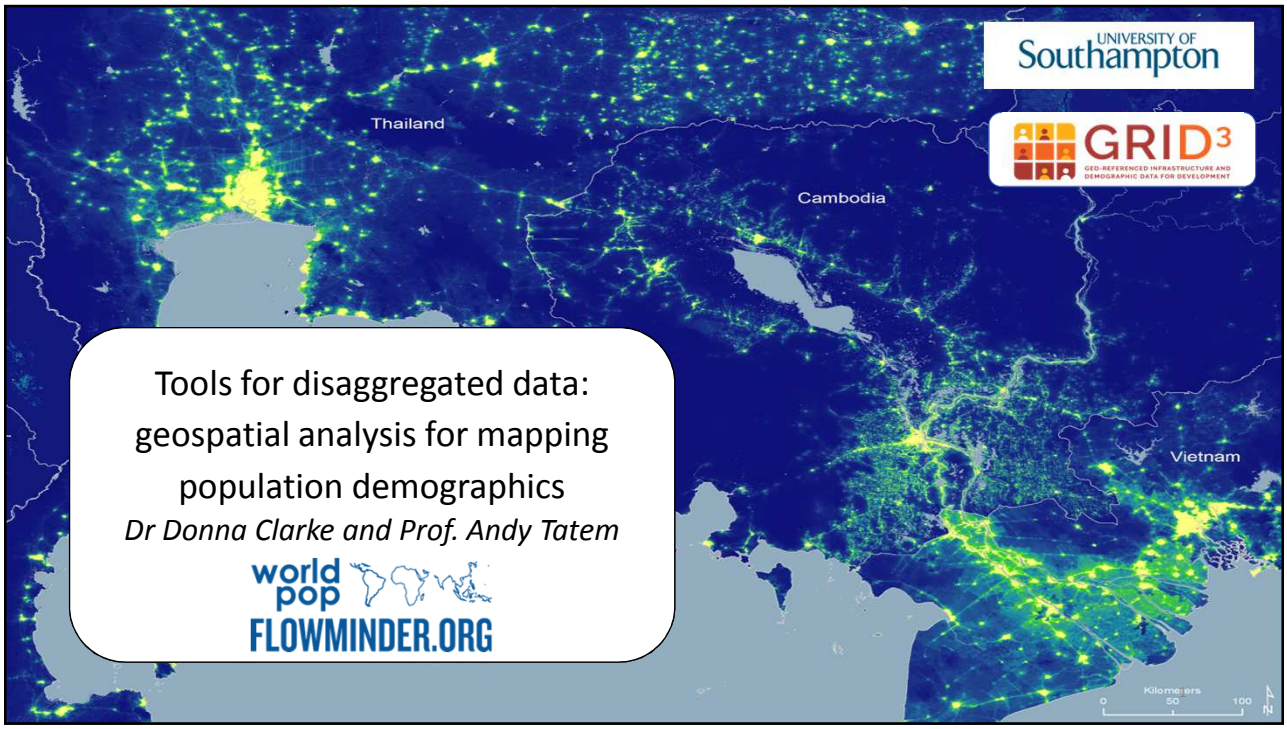


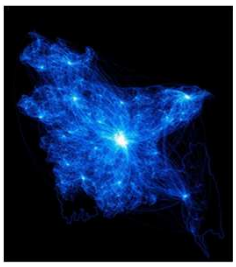
Tools for disaggregated data: geospatial analysis for mapping population demographics

Dr Donna Clarke and Prof. Andy Tatem

world pop FLOWMINDER.ORG

DATA-POP ALLIANCE

- **WorldPop**: Research program focused on methods for improving the demographic evidence base in low/middle income countries
- **Flowminder**: Non-profit foundation working with data providers and international/government agencies to operationalize and scale research in support of vulnerable populations and sustainable development
- Open data, open methods
- 60+ researchers, data scientists, PhD students, support staff based primarily in Southampton

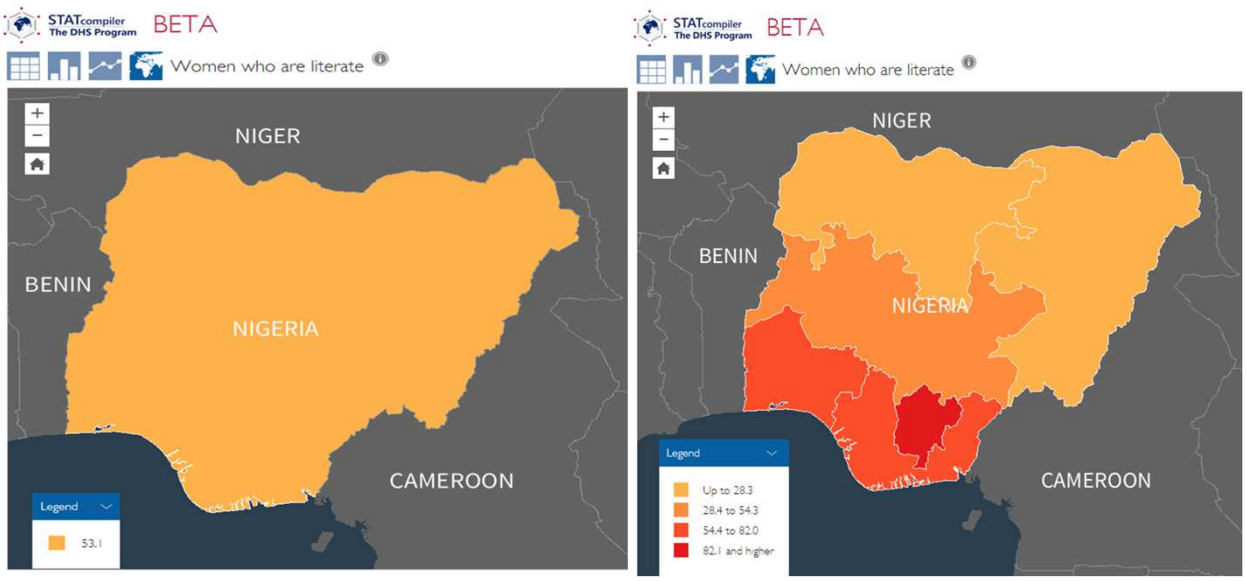


Key partners and donors

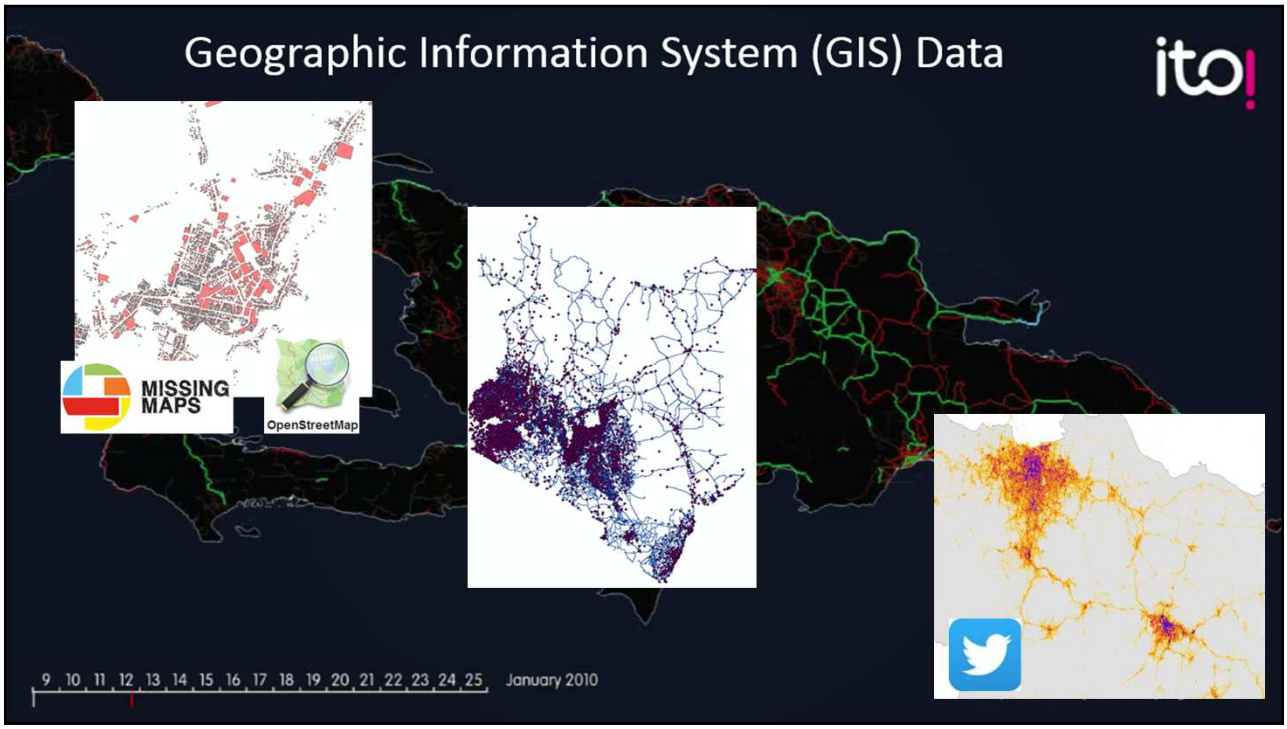
2015-2030: 17 goals, 169 targets

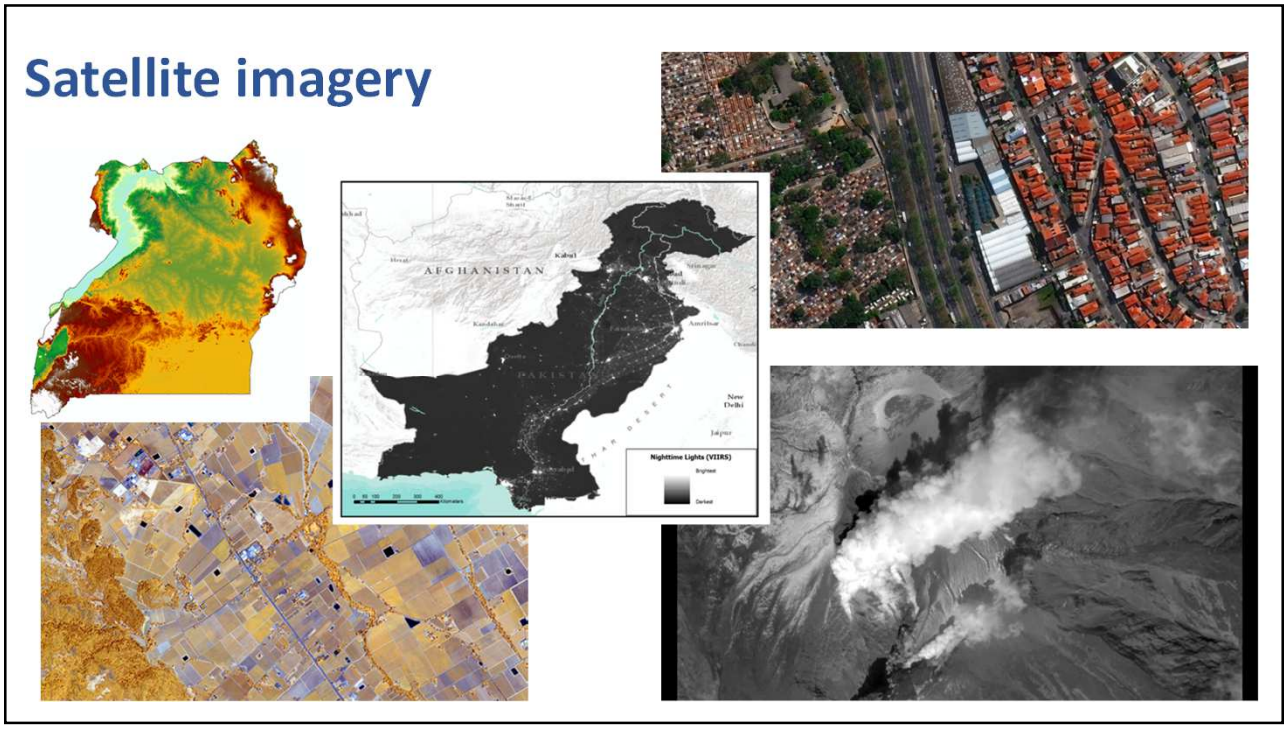
"Everywhere"

Women who are literate in Nigeria

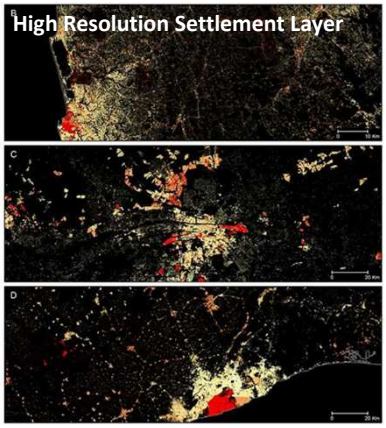


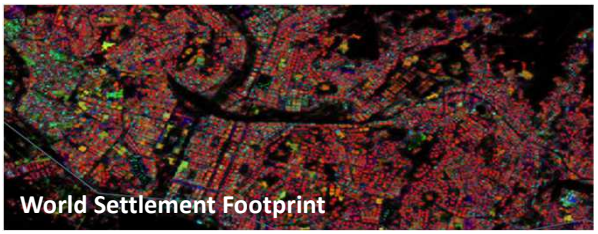
How can we produce subnational data?


Geographic Information System (GIS) Data
ito
MISSING MAPS
OpenStreetMap
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 January 2010


Satellite imagery
AFGHANISTAN
Kabul
Amritsar
New Delhi
Jaipur
Nighttime Lights (VIIRS)

High Resolution Built-Up/Settlement Datasets

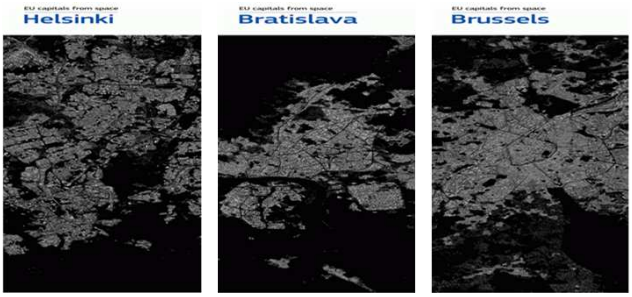




DLR

facebook

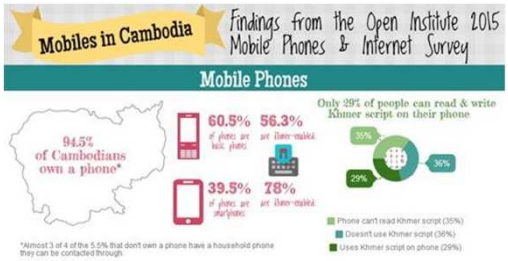
European Commission



Global Human Settlement Layer

Mobile phone call detail records (CDRs)

Source: GSMA The mobile economy Asia Pacific 2017
https://www.gsmaintelligence.com/research/?file=336a9db2ab3ed95bc70e62bf7e867855&download



Source: Open Institute and the Asia Foundation 2015
http://www.chamnanmuon.com/2015/11/mobile-phones-internet-cambodia-2015.html

Source: Nielsen. The digital media habits and attitues of South East Asian Consumers 2011
https://wiki.smu.edu.sg/digitalmediaasia/Digital_Media_in_Thailand

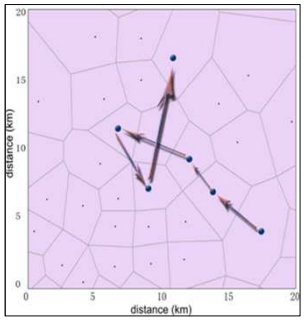
Mobile phone call detail records (CDRs)

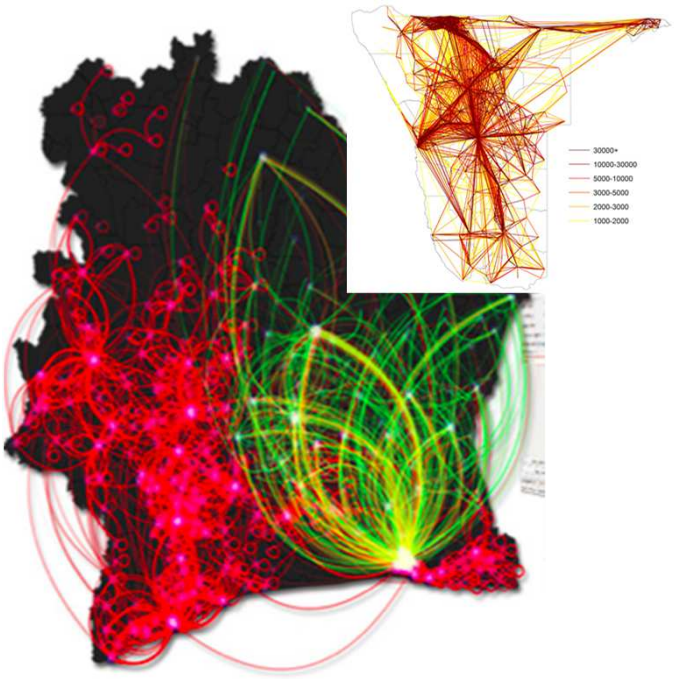
User makes a call from location X

Call routed through nearest tower

Network operator records time and tower of call for billing

User travels to Y and makes a call





1 NO POVERTY

Mobility: Changing densities, flows, seasonal/permanent migration

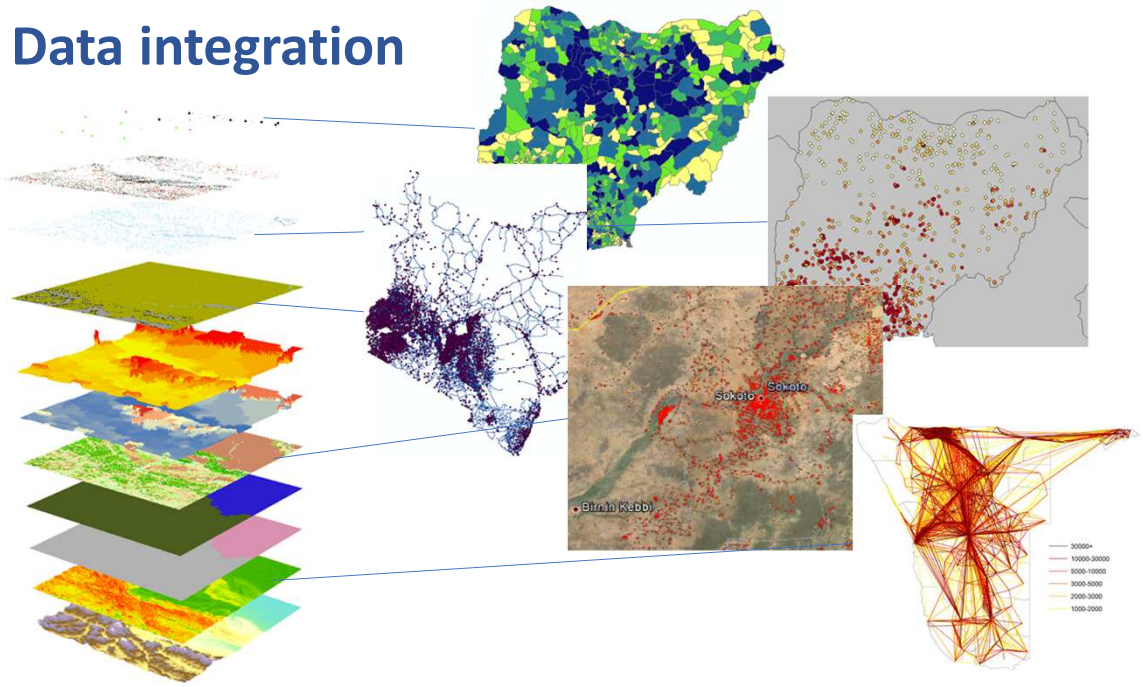
Social networks: Number of contacts, calling patterns

Consumption: Credit purchase frequencies, top-up amounts

Protecting confidentiality
-Aggregate summaries
-Regulator approval
-Raw data never leaves operator

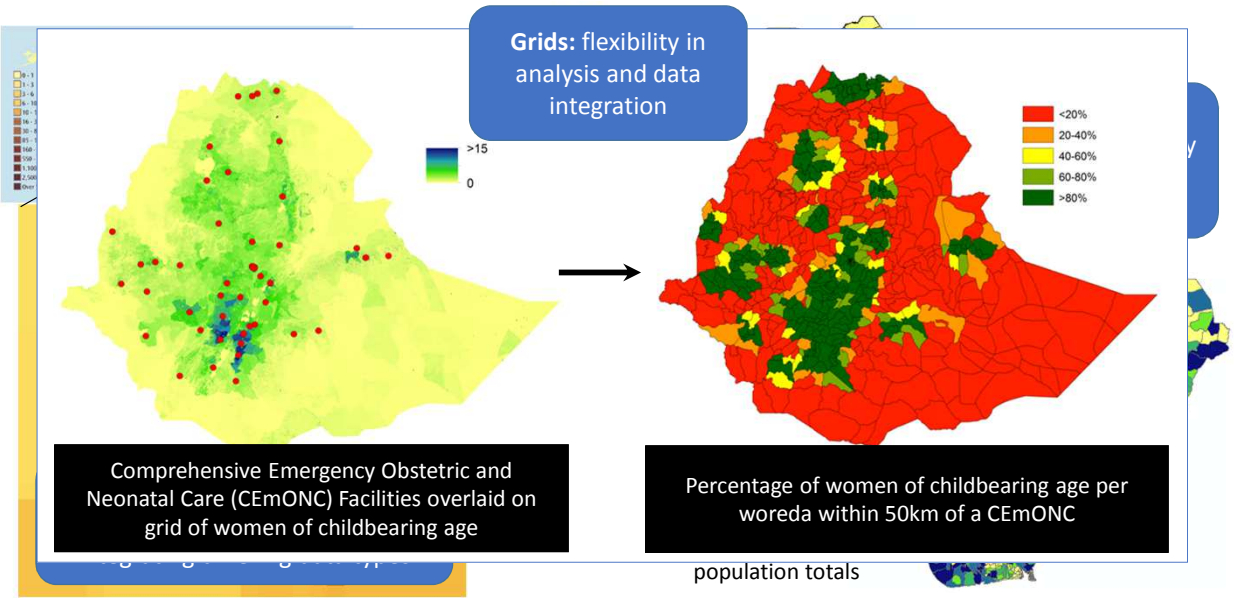
FLOWMINDER.ORG worldpop

Data integration

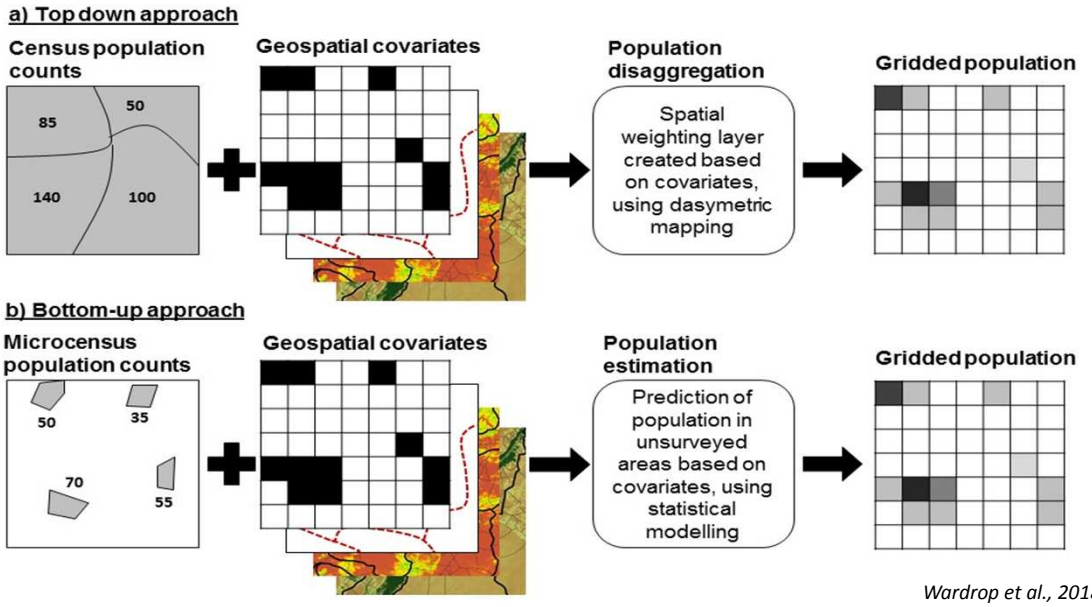


How can we use this data?

Gridded population data



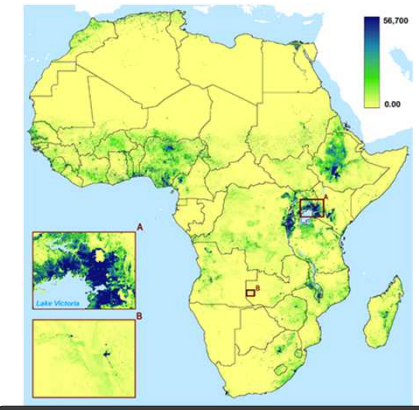
Top-Down Vs Bottom-Up Approach



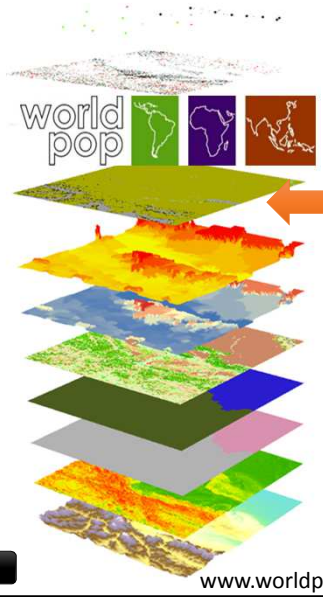
Wardrop et al., 2018 (PNAS)

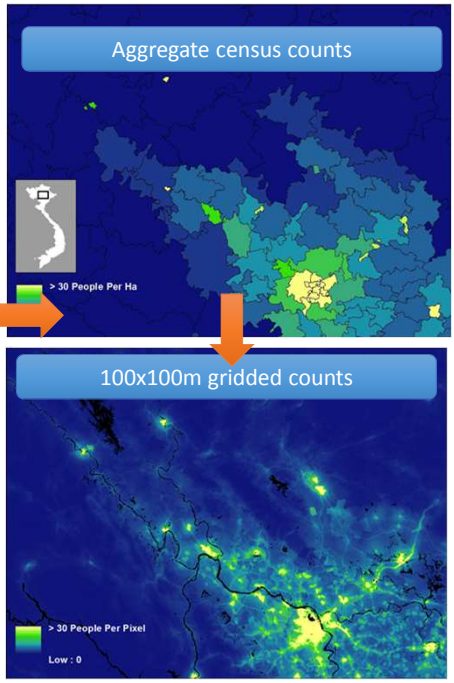
Top-down disaggregation

Integration with satellite/GIS data related to human population distribution patterns to disaggregate counts to regular grids



People per 1x1km 2017



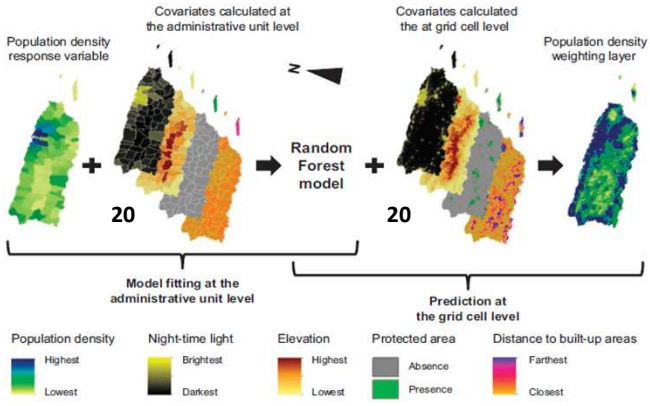


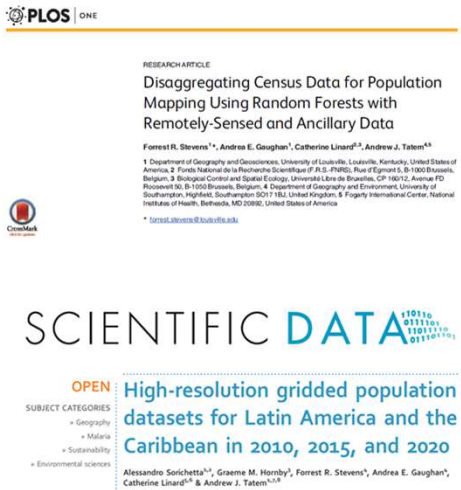
www.worldpop.org

Tatem (2017) Nature Sci Data

Random Forest-based Dasymetric Approach

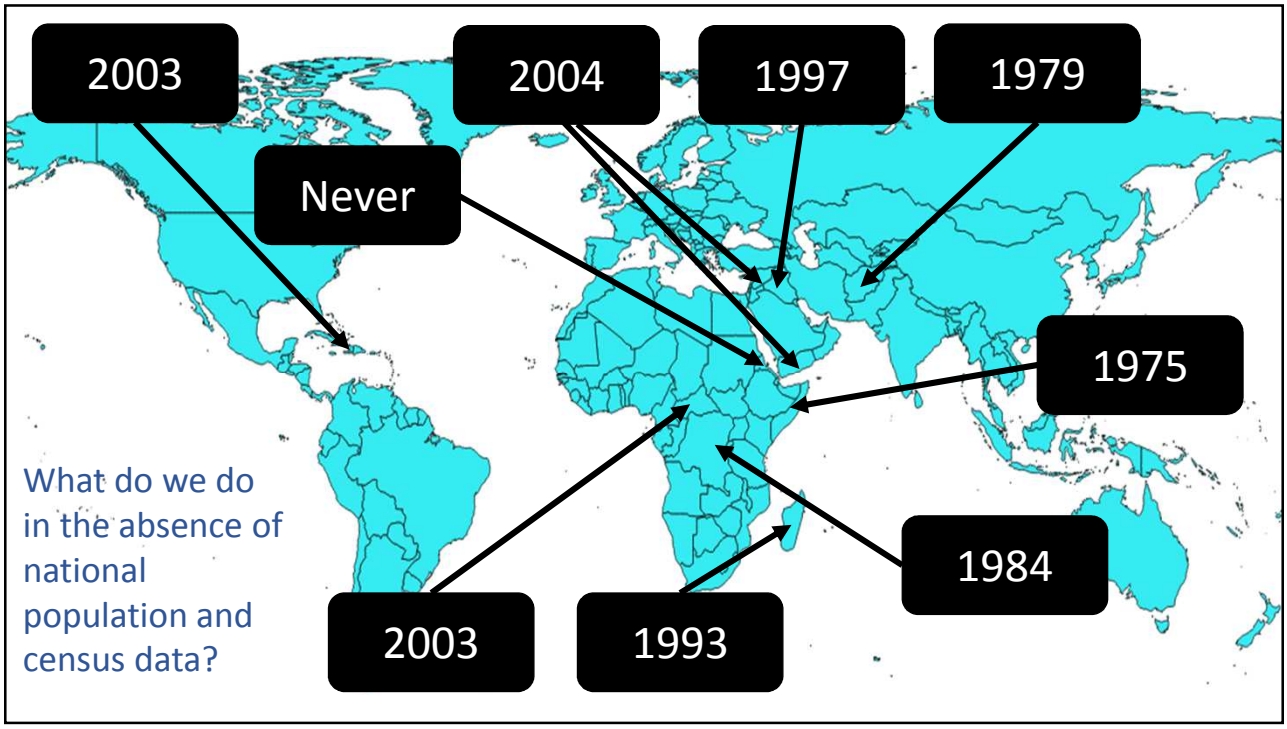
- Used to disaggregate subnational census-based figures^, #





^Stevens et al, 2015; #Sorichetta et al., 2015

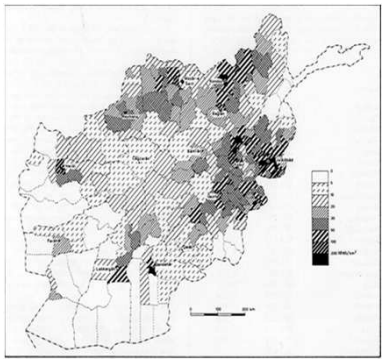
Isn't there a basic data problem in some countries?



High-resolution population mapping in Afghanistan

UNFPA world pop FLOWMINDER.ORG BILL & MELINDA GATES foundation University of Southampton

Afghanistan - Background



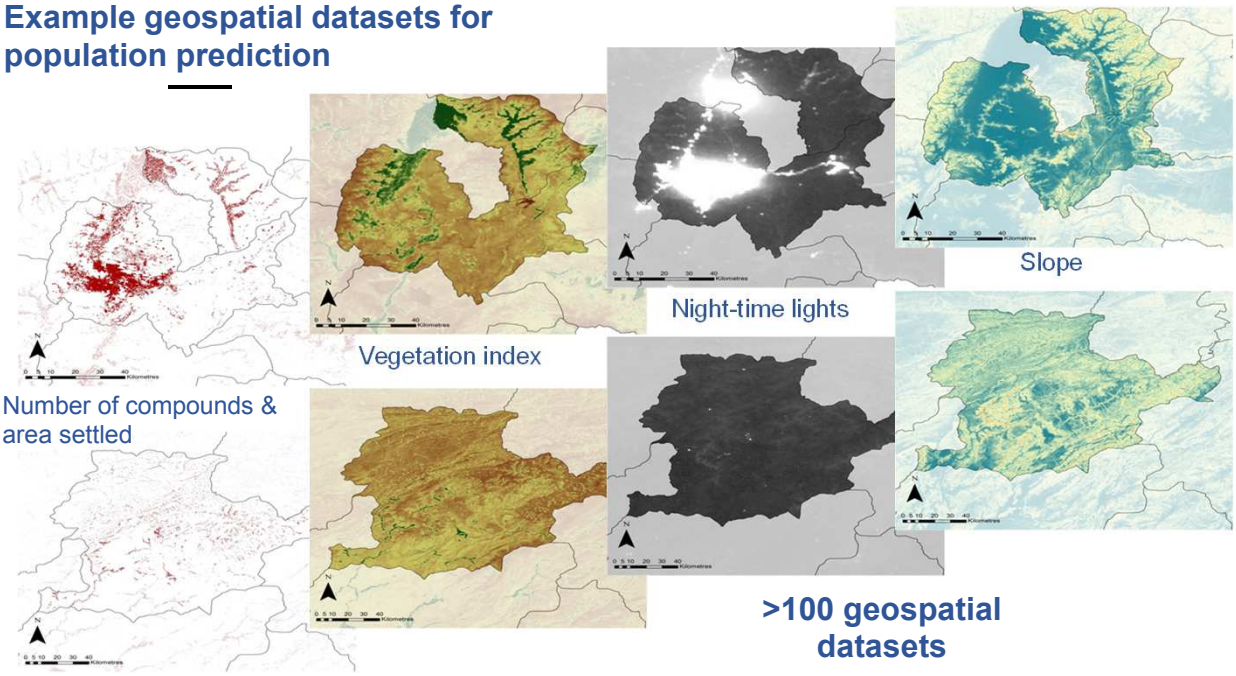
Last national population census was in 1979
Significant uncertainties in national and subnational estimates

1979 Census map

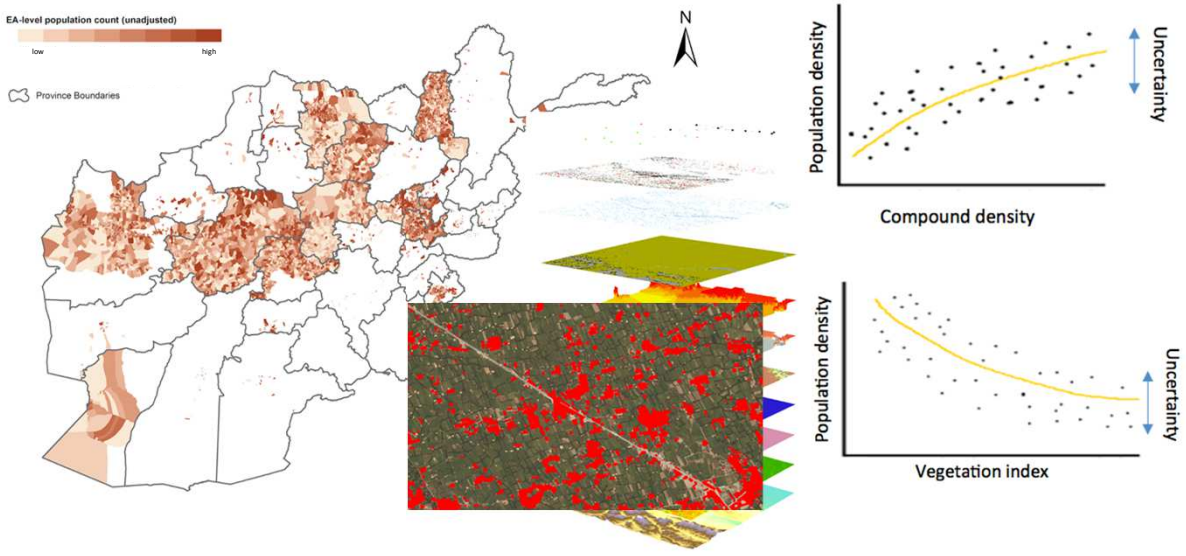
One-third of country covered by a rolling census (SDES), but insecurity preventing additional data collection

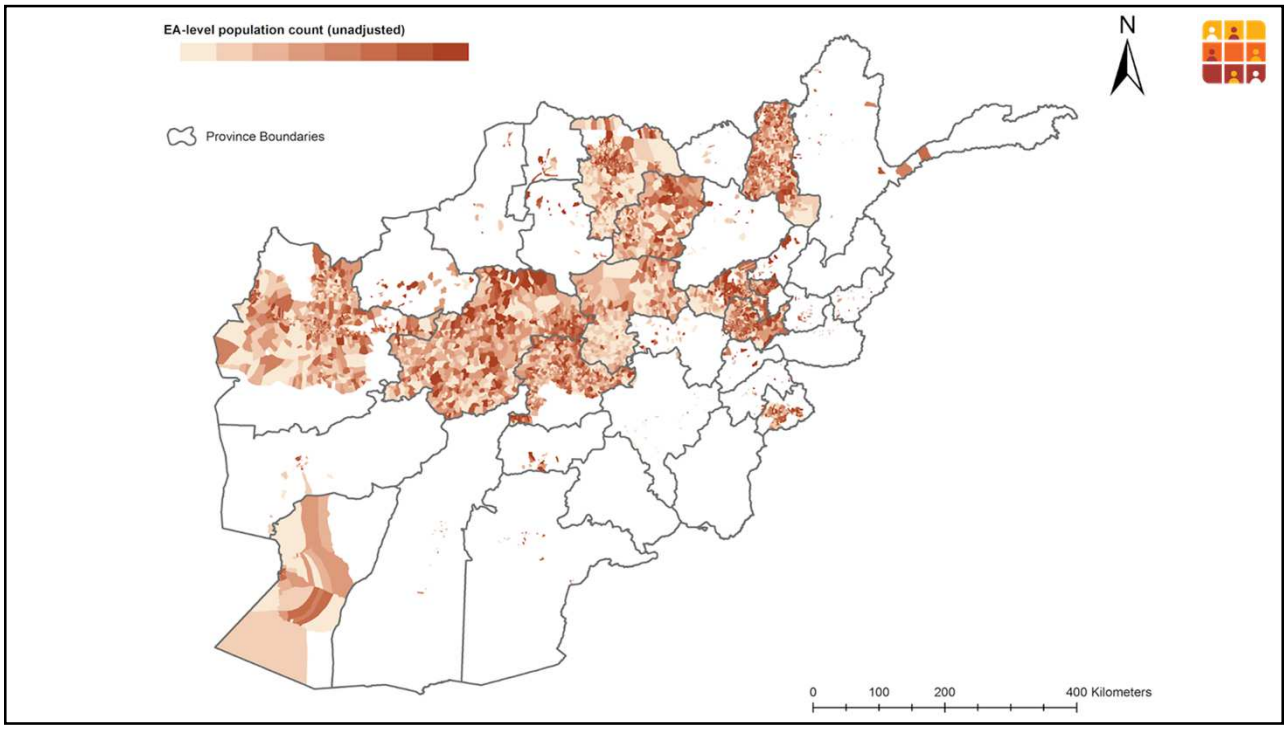
President Ghani requested exploration of new methods for obtaining subnational population numbers

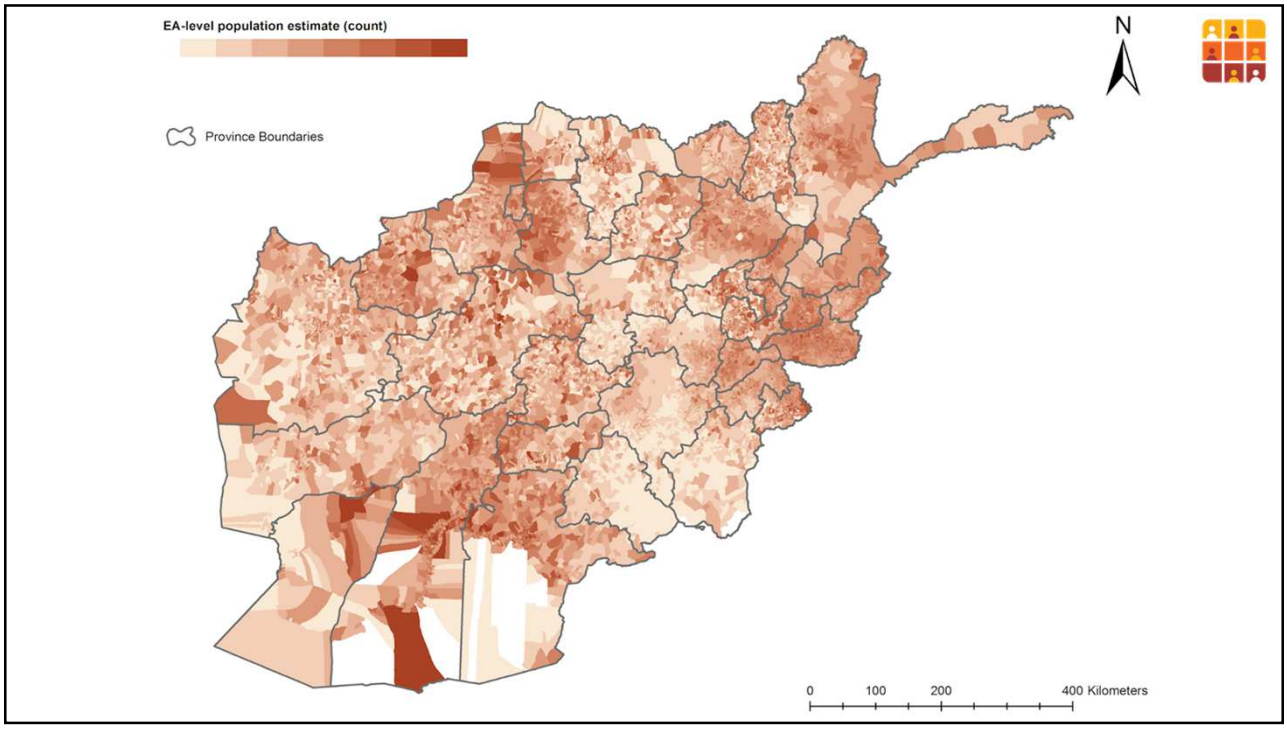
Example geospatial datasets for population prediction

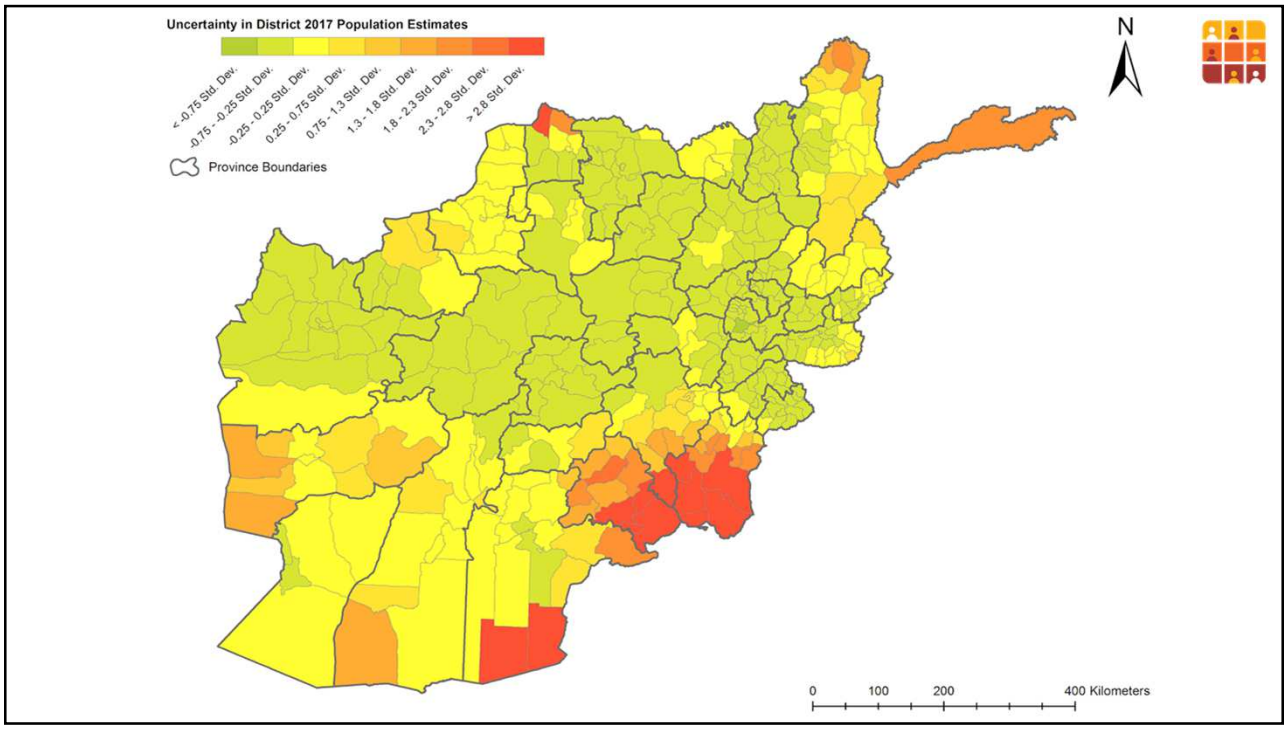


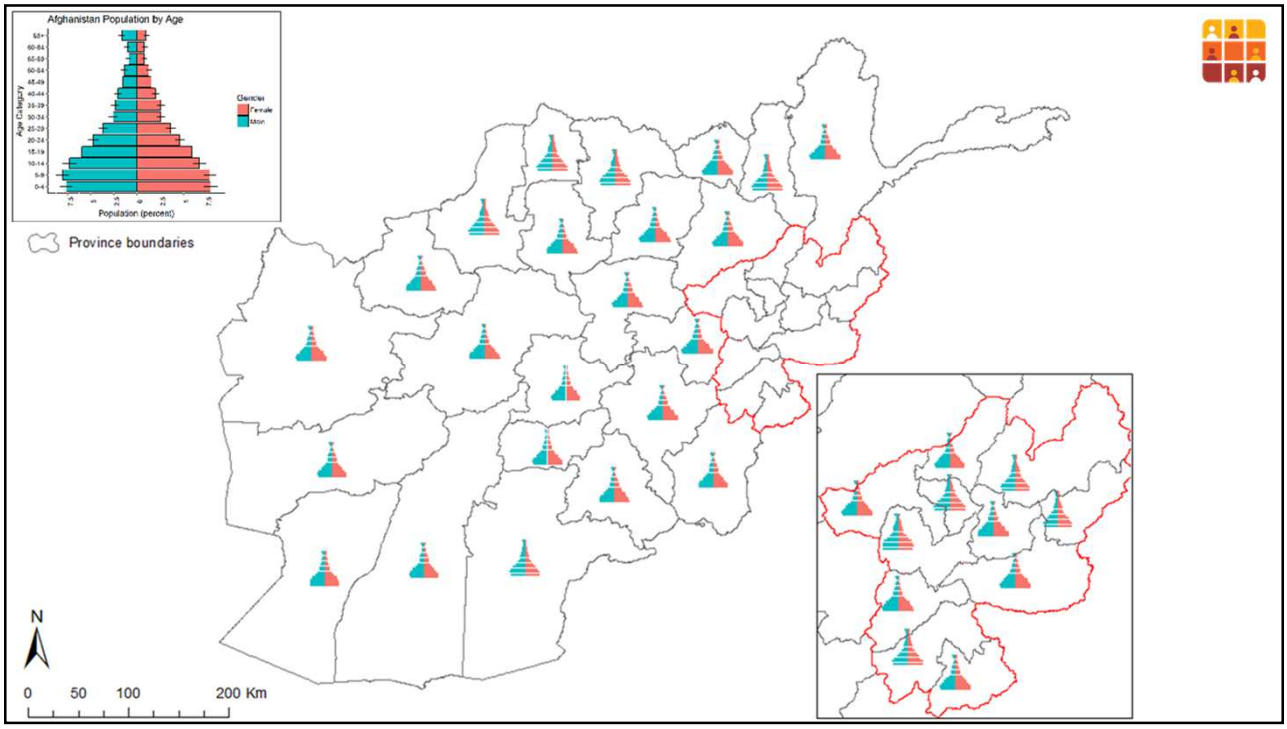
Model-based estimates




EA-level population count (unadjusted)
Province Boundaries
N
0
100
200
400 Kilometers


EA-level population estimate (count)
Province Boundaries
N
0
100
200
400 Kilometers


Uncertainty in District 2017 Population Estimates
< -0.75 Std. Dev.
-0.75 - -0.25 Std. Dev.
-0.25 - 0.25 Std. Dev.
0.25 - 0.75 Std. Dev.
0.75 - 1.3 Std. Dev.
1.3 - 1.8 Std. Dev.
1.8 - 2.3 Std. Dev.
2.3 - 2.8 Std. Dev.
> 2.8 Std. Dev.
Province Boundaries
N
0 100 200 400 Kilometers


Afghanistan Population by Age
Age Category
Gender
Female
Male
Population (percent)
Province boundaries
N
0 50 100 200 Km

GRID3

GRID3

GEO-REFERENCED INFRASTRUCTURE AND DEMOGRAPHIC DATA FOR DEVELOPMENT

BILL & MELINDA GATES foundation

UKaid from the British people

world pop FLOWMINDER.ORG

UNFPA

Center for International Earth Science Information Network
EARTH INSTITUTE | COLUMBIA UNIVERSITY

Our vision

GRID3

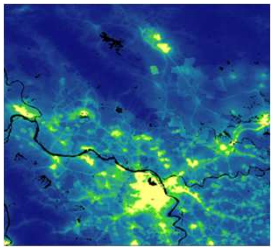
"We envision a world where data analytics puts everyone on the map, ensuring that especially the most vulnerable count.

What we do

GRID3

GRID^3 provides support to low- and medium-income countries to collect, analyse, integrate, disseminate, and utilise high-resolution geo-referenced data for development and humanitarian decision making.






A Global Partnership

GRID3

Funding Partners

Bill & Melinda Gates foundation

UKaid from the British people

Oversight and Decision Making

Implementing Partners

world pop FLOWMINDER.ORG

UNFPA

Technical Expertise and Capacity Strengthening

Managing Partner

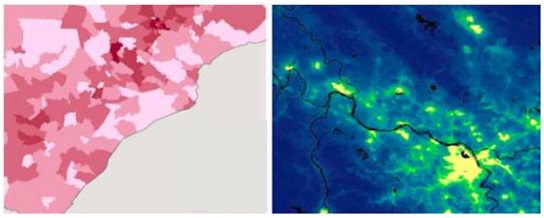
Center for International Earth Science Information Network
Earth Institute | Columbia University

Technical Support and Advocacy

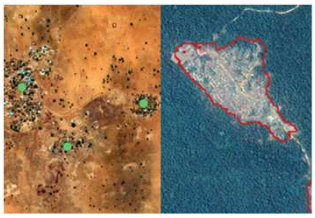
Spatial Data Production

GRID³ helps produce three spatial data layers to meet critical development needs:

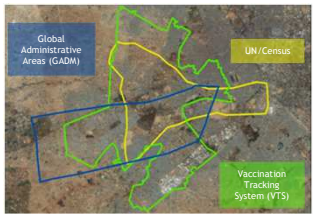
High-Resolution Population Maps



Settlement Locations



Subnational Boundaries



Current Focus

GRID³ is underway within five African countries:

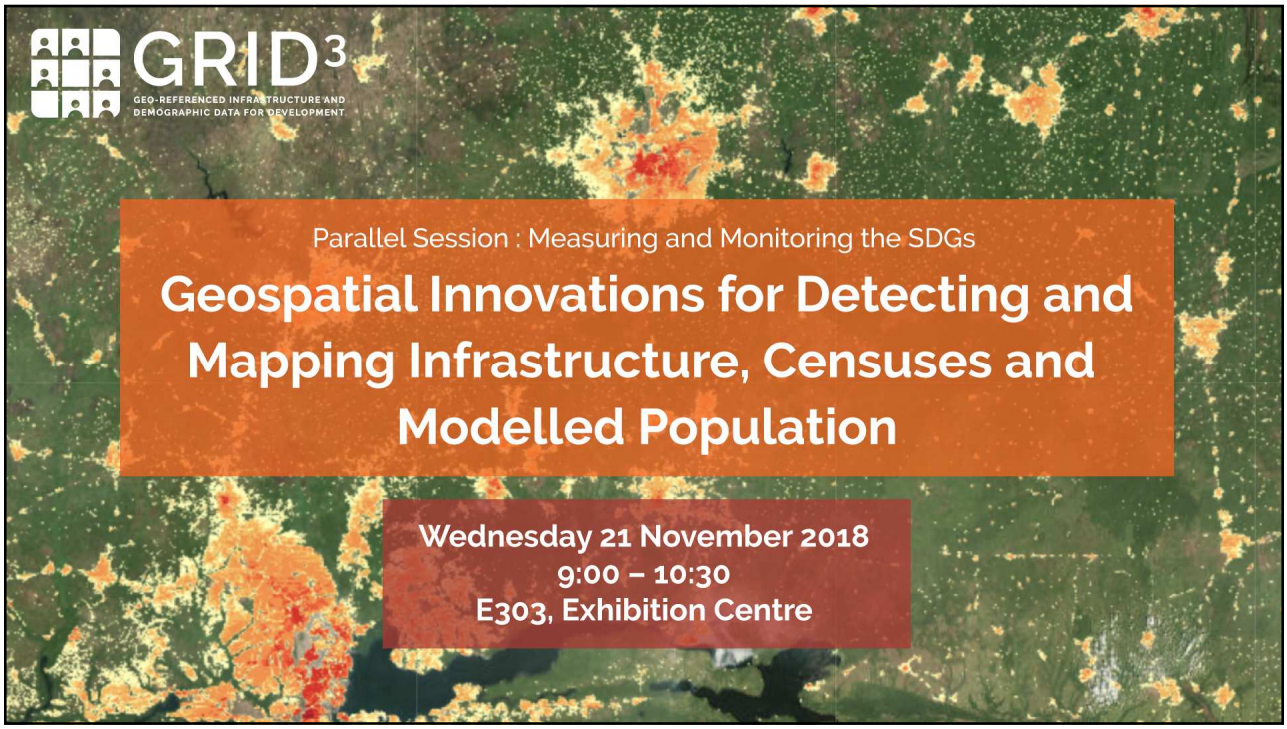
Nigeria

Mozambique

Zambia

Tanzania

Democratic Republic of the Congo


GRID3
GEO-REFERENCED INFRASTRUCTURE AND DEMOGRAPHIC DATA FOR DEVELOPMENT
Parallel Session : Measuring and Monitoring the SDGs
Geospatial Innovations for Detecting and Mapping Infrastructure, Censuses and Modelled Population
Wednesday 21 November 2018
9:00 – 10:30
E303, Exhibition Centre